We claim:

1) A tunable optical filter comprising: an expander having an expander extent and a coefficient of expansion;

an optical fiber having a grating, said grating having an extent;

said expander positioned around said optical fiber, and said optical fiber grating extent included in said extent of said expander extent;

said expander bonded continuously to said optical fiber over said extent of said expander;

said expander responsive to a control.

2) The tunable filter of claim 1 where said control is a varying magnetic field.

3) The tunable filter of claim 2 where said tunable filter includes a magnetic field generator producing a magnetic field which is coupled to said expander.

4) The tunable filter of claim 3 where said magnetic field generator comprises an coil wound about said expander.

5) The tunable filter of claim 1 where said control is a varying temperature.

6) The tunable filter of claim 5 where said tunable filter includes a heating device coupled to said expander.

7) The tunable filter of claim 1 where said filter is sensing a temperature, and said control comprises the temperature to be sensed.

8) The tunable filter of claim 1 where said filter is sensing a magnetic field, and said control comprises the magnetic field to be sensed.

9) The tunable filter of claim 1 where said expander is made from $Tb_{0.3}\ Dy_{0.7}\ Fe_{1.9}$.

10) A tunable optical filter comprising: an expander having an expander extent, a coefficient of expansion, a first attachment, and a second attachment, said attachments separated by an attachment extent;

an optical fiber having a grating, said grating having a grating extent;

said expander positioned around said optical fiber, and said optical fiber grating extent is included in said extent of said attachment extents;

said expander bonded to said optical fiber at said first attachment and said second attachment;

said expander responsive to a control.

11) The tunable filter of claim 10 where said control is a varying magnetic field.

12) The tunable filter of claim 11 where said tunable filter includes a magnetic field generator producing a magnetic field which is coupled to said expander.

13) The tunable filter of claim 12 where said magnetic field generator comprises an coil wound about said expander.

14) The tunable filter of claim 10 where said control is a varying temperature.

15) The tunable filter of claim 14 where said tunable filter includes a heating device coupled to said expander.

16) The tunable filter of claim 10 where said filter is sensing a temperature, and said control comprises the temperature to be sensed.

17) The tunable filter of claim 10 where said filter is sensing a magnetic field, and said control comprises the magnetic field to be sensed.

18) The tunable filter of claim 10 where said expander is made from $Tb_{0.3}\ Dy_{0.7}\ Fe_{1.9}$.

19) The tunable filter of claim 10 where said expander is made from zinc.

20) A tunable optical filter comprising: an optical fiber having a grating, said grating having an extent;

an expander having an expander extent, a coefficient of expansion, a first attachment, and a second attachment, said attachments positioned at opposite ends of said expander;

a first expansion extent reducer coupled to said expander said first attachment, said expansion extent reducer having a fiber attachment bonded to one end of said optical fiber grating extent;

a second expansion extent reducer coupled to said expander said second attachment, said expansion extent reducer having a fiber attachment bonded to the other end of said optical fiber grating extent;

said expansion extent reducers having a coefficient of expansion value which is less than half of said expander coefficient of expansion;

said expansion extent reducers fiber attachments having an extent which includes said extent of said optical fiber grating;

said expander responsive to a control.

21) The tunable filter of claim 20 where said control is a varying magnetic field.

22) The tunable filter of claim 21 where said tunable filter includes a magnetic field generator producing a magnetic field which is coupled to said expander.

23) The tunable filter of claim 22 where said magnetic field generator comprises an coil wound about said expander.

24) The tunable filter of claim 20 where said control is a varying temperature.

25) The tunable filter of claim 24 where said tunable filter includes a heating device coupled to said expander.

26) The tunable filter of claim 20 where said filter is sensing a temperature, and said control comprises the temperature to be sensed.

27) The tunable filter of claim 20 where said filter is sensing a magnetic field, and said control comprises the magnetic field to be sensed.

28) The tunable filter of claim 20 where said expander is made from Terfenol™.

29) The tunable filter of claim 20 where said expander is made from zinc.

30) A tunable filter comprising:

an optical fiber having a grating, said grating having a grating extent;

a first tube with said optical fiber inside said tube, said optical fiber bonded to said first tube on one side of said grating extent;

a second tube with said optical fiber inside said tube, said optical fiber bonded to said second tube on opposite side of said grating extent;

one or more expanders surrounding said first and said second tube, said one or more expanders of similar length

and collectively having a first end and a second end opposite said first end, said first end bonded to said first tube and said second end bonded to said second tube.

31) The tunable filter of claim 30 where said expanders are made from Terfenol™.

32) The tunable filter of claim 30 where the number of said expanders is 3.

33) The tunable filter of claim 30 where the number of said expanders is 4.

34) The tunable filter of claim 30 where said expanders are rods.

35) The tunable filter of claim 30 where said expander first end bonded to said first tube includes a first end stop bonded to said first tube, said first end stop having an extent which includes said expander first end.

36) The tunable filter of claim 30 where said expander second end bonded to said second tube includes a second end stop bonded to said second tube, said second end stop having an extent which includes said expander second end.

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